A1 Cont

for by the terms of Contract No. 70NANB8H4014 awarded by NIST.

Please substitute the following amended paragraph for the second full paragraph on page 1 as follows:

The use of micro-hinges has become prevalent with the increased utilization and complexity of surface micro-machined components and systems. Typically used in the implementation of out-of-plane or vertically oriented micro-device designs, the micro-hinge is usually fabricated in a minimum two-layer, though typically three-layer, polysilicon process. Such a hinge, known as a staple hinge 10, is illustrated in FIGURE 1 integrally connected with micro-mirror 12, and is used to attain out-of-plane motion. The multi-step fabrication process, includes depositing a layer which is then patterned and etched. Next a second layer is deposited, patterned and etched in such a way that after removing any filling material, the first layer is free to move in a prescribed path, while being held in place by the second layer. This structure creates a rotating joint implemented in MEMS or micro-systems to permit for the mechanical movement required for out-of-plane or vertically oriented devices.

A2

Please substitute the following amended paragraph for the first full paragraph on page 2, under "Summary of the Invention" as follows:

Provided is a micro-electromechanical assembly including a micro-device formed in the device layer of a silicon-on-insulator substrate. A ribbon structure is formed in the same device layer, where the ribbon structure is less than the thickness of the micro-device. A connection interface provides a connection point between a first end of the micro-device and a first end of a ribbon structure, wherein the ribbon structure and micro-device are integrated as a single assembly. An electrical conductor is formed extending from one end of the ribbon structure to the micro-device tethered at the other end.

A3

Please substitute the following paragraph for the paragraph on page 3 under "Detailed Description of Preferred Embodiments" as follows:

While Figure 1 depicts a micro-assembly implementing a polysilicon staple/door-hinge, FIGURES 2 and 3 illustrate a micro-assembly 18 having a ribbon hinge 20

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integrated with micro-device 22, such as a micro-mirror. The micro-mirror device 22 has been moved from an in-plane position to an angle of approximately 30°. Particularly, the ribbon hinge structure is configured with a mechanical integrity which permits application of a side-twisting mechanical torque sufficient to twist the ribbon hinge structure to 90° or more from an initial 0° twisted position. Movement of the mirror is achievable by a variety of mechanisms, including the use of a micro-probe or an actuator.

Please substitute the following amended paragraph for the first full paragraph on page 7 as follows:

Following removal of first photo-resist layer 40, second resist layer 48 is applied on the top surface of SOI 30. In step 50, a dry etching process is undertaken on the exposed silicon of device layer 32 to form the out-of-plane micro-device 52, as well as the island area 54, anchor structure 56 and isolation region or groove 57.

Please substitute the following amended paragraph for the second full paragraph on page 7 as follows:

Turning to FIGURE 5, set forth is a top view of step 58 of FIGURE 4. Ribbon hinge 42 is shown connected to anchor portion 56 at a first end and to micro-device 52 at a second end. Patterned within micro-device 52 is isolation region 57. As will be discussed in greater detail below, isolation region 57 is patterned within micro-device 52 to isolate an electrical conductor to be deposited therein, from the remainder of micro-device 52. It is to be appreciated that an isolation groove may also be patterned within the ribbon structure 42 and anchor 56. The additional areas where isolation grooves may be etched are shown in FIGURE 6, which may be considered a further embodiment of the etching process shown in FIGURE 4. Herein, two isolation regions 57A and 57B are etched into micro-device 52. Isolation regions 57C and 57D are also to be etched within ribbon structure 42 through anchor 56. FIGURE 6 emphasizes that multiple conductor lines may be processed on a single ribbon hinge 42 and/or micro-device 52. It is also to be understood that multiple ribbon hinges may be attached to a single micro-device.

Please substitute the following amended paragraph for the second full paragraph on page 8 as follows:

Once electrical conductive material 65 has been deposited, the buried oxide release (BOX) operation is undertaken, whereafter, as shown in step 66 of FIGURE 4, the only remaining buried oxide layer material 68 and 70 is under the island structure 54 and the anchor section 56. The remaining buried oxide material is removed such that a separation layer 72 and separation edge 74 are void of such material. Removal of the buried oxide allows for the movement of the micro-device 52 and ribbon hinge 42. In step 66, it is noted that all remaining photo-resist is removed, for example, by a dry O_2 plasma-etch process.

Please substitute the following amended paragraph for the third full paragraph on page 8 as follows:

Thus, step 66 depicts the original SOI wafer 30 as a micro-device and hinge assembly, with a conductor.

Please substitute the following amended paragraph for the paragraph beginning on page 8 and continuing onto page 9 as follows:

Turning to FIGURE 8, set forth is a completed micro-assembly 75 according to the teachings of the present invention. More particularly, a ribbon hinge 42 as described in the foregoing, is integrally attached at a first end to a micro-device 52 and at a second end to an anchor portion 56. Micro-device 52 includes an etched isolation region 57. Deposited within isolation region 57 is a conductive material 65 which is also deposited on ribbon hinge 42 and within an isolation groove of anchor 56. An electronic device 76 is in operational connection to the electrical conductor material 65 within isolation region 57. A power source 78 is in connection with the electrical conductor material 65, at an opposite end by anchor portion 56. Electronic device 76 may be activated upon application of electrical power from electrical power source 78. Further, electrical device 76 may be any one of a number of devices such as an actuator to assist in movement of micro-device 52.